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Third Edition

VIROLOGY

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CHAPTER 2. THE STRUCTURE, COMPONENTS, AND CLASSIFICATION OF VIRUSES

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TABLE 2-4. THE MAJOR FAMILIES OF ANIMAL VIRUSES (Continued)

| RNA-Containing Viruses | | |
|---|---|--|
| Hepadnaviridae | | |
| | <ul style="list-style-type: none"> • Enveloped icosahedral nucleocapsids • Diameter: 42 nm <p>Hepadnavirus genomes are the smallest human or animal virus genomes known (about 3 kilobase pairs). Their lipoprotein envelope (surface antigen, HBsAg) possesses an extraordinary tendency for self-association, forming spherical or rodlike particles (diameter 22 nm) that are often present in the sera of infected individuals in 10,000-fold excess over the 42 nm virions, also known as Dane particles. HBsAg possesses several epitopes, some of which are group-specific, while others are not only type-specific but subtype-specific; thus eight allelic subtypes of human HBV have been described. The epitopes on the core component (HBcAg) are partially group-specific. The replication of hepadnavirus DNA involves reverse transcription of RNA into DNA. Hepadnaviruses exhibit tissue tropism for hepatocytes. Persistent infections are common. Hepadnavirus DNA is capable of integrating into cellular DNA.</p> | |
| Hepatitis B virus (HBV) | Host Humans | Symptoms in humans Acute and chronic hepatitis; cirrhosis; hepatocellular carcinoma; immune complex disease; polyarteritis; glomerulonephritis; infantile papular acrodermatitis; aplastic anemia |
| Woodchuck hepatitis B virus (WHBV) | Eastern woodchuck | — |
| Ground squirrel hepatitis B virus (GSHBV) | Ground squirrel | — |
| Duck hepatitis B virus (DHBV) | Peking duck | — |
| Tree squirrel hepatitis B virus (TSHBV) | Tree squirrel | — |
| Parvoviridae | | |
| | <ul style="list-style-type: none"> • Naked icosahedral nucleocapsids • Diameter: 22 nm <p>Parvoviruses contain single-stranded DNA. Members of the genus <i>Parvovirus</i> encapsidate negative-stranded DNA preferentially (50–99%); but particles of members of the <i>Dependovirus</i> and <i>Densovirus</i> genera encapsidate plus- and minus-stranded DNA with equal efficiency. The replication of parvoviruses tends to be dependent on helper functions which for members of the genus <i>Parvovirus</i> are supplied by rapidly growing (not resting) cells, which explains why they are often found associated with tumors and possess oncolytic properties; and for members of the genus <i>Dependovirus</i> by coinfection with adenoviruses, herpesviruses, or poxviruses. The essential function that must be supplied is most probably activation of the transcription of the parvovirus genome. Members of the genus <i>Parvovirus</i> are 70–90% related genetically; those of the genus <i>Dependovirus</i> 60–70%. The rodent parvoviruses are unrelated immunologically to FPLV, CPV, and MEV, which are themselves closely related immunologically. Parvoviruses generally have narrow host ranges. Parvoviruses can establish latent infections; cells latently infected possess parvovirus genomes integrated into their DNA, but are not transformed and exhibit no discernible change in phenotype.</p> | |
| Genus <i>Parvovirus</i> | Host | Symptoms in humans |
| Parvovirus-like agent (PVLA) Strain B19 | Humans | Erythema infectiosum (fifth disease); linked to aplastic crisis in hemolytic anemia/sickle cell anemia |
| Lu-111 | Humans | No known disease |
| Feline panleukopenia virus (FPLV) | Cat | — |
| Canine parvovirus (CPV) | Dog | — |
| Mink enteritis virus (MEV) | Mink | — |
| Hamster osteolytic viruses (H-1, H-3, x-14) | Rat, hamster | — |
| Kilham rat virus (KRV) | Rat | — |
| Minute virus of mice (MVM) | Mouse | — |
| Aleutian mink disease virus | Mink | — |
| Porcine parvovirus | Pig | — |
| Bovine parvovirus | Cattle | — |
| Genus <i>Dependovirus</i> | | |
| Adeno-associated virus (AAV) Serotypes 1,2,3,5 Serotype 4 | Humans Monkeys | Antibodies very prevalent; no known symptoms |
| Genus <i>Densovirus</i> | | |
| Densonucleosis viruses | Insects | — |
| RNA-containing Viruses | | |
| Picornaviridae | | |
| | <ul style="list-style-type: none"> • Naked icosahedral nucleocapsids • Diameter: 25–30 nm <p>Picornaviruses comprise a large number of virus strains pathogenic for many animals species. They are subdivided into four genera: <i>Enterovirus</i> and <i>Cardiovirus</i>, whose members are acid-stable, and <i>Rhinovirus</i> and <i>Aphthovirus</i>, whose members are acid-labile.</p> | |
| Genus <i>Enterovirus</i> | Host | Symptoms in humans |
| Human enteroviruses Poliovirus 2 serotypes | Humans, monkey | Poliomyelitis |

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TABLE 2-4. THE MAJOR FAMILIES OF ANIMAL VIRUSES (Continued)

| RNA-Containing Viruses | | |
|--|--|--|
| Retroviridae (RNA tumor viruses) | | |
| | <ul style="list-style-type: none"> • Enveloped particles containing a coiled nucleocapsid within a probably icosahedral core shell • Diameter: about 100 nm <p>The retrovirus family comprises a large group of viruses characterized by a common morphology, a genome that consists of two identical plus-stranded RNA molecules, and possession of reverse transcriptase. There are three subfamilies. The first, the <i>Oncovirinae</i>, comprises the C-, B-, and D-type retroviruses. These viruses are oncogenic; they cause leukemias, lymphomas, mammary and neuronal tumors. The second subfamily, the <i>Lentivirinae</i>, comprises the <i>Visna</i> group of viruses. They resemble the <i>Oncovirinae</i> with respect to morphology, nature of the genome and possession of a reverse transcriptase, but do not transform cells. The third subfamily, the <i>Spumavirinae</i>, comprises the foamy viruses, which are found in spontaneously degenerating kidney (and other) cell cultures, causing the formation of multinucleated vacuolated giant cells that have a highly characteristic appearance.</p> | |
| Subfamily | Host | Symptoms in humans |
| <i>Oncovirinae</i> | | |
| Genus <i>Oncornavirus C</i> | | |
| Subgenus <i>Oncornavirus C avian</i> | | |
| Endogenous leukemia/leukosis viruses (RAV-0, RAV-1, RAV-2, etc.) | Chicken | — |
| Nondefective avian sarcoma viruses (ASV) | Chicken | — |
| Defective sarcoma/acute leukemia viruses | Chicken | — |
| Numerous viruses including | | |
| Fujinami sarcoma virus (FSV) | | |
| Avian myeloblastosis virus (AMV) | | |
| Avian erythroblastosis virus (AEV) | | |
| Avian myelocytomatosis virus (MC29) | | |
| Reticuloendotheliosis virus (REV) | Chicken, duck | — |
| Subgenus <i>Oncornavirus C mammalian</i> | | |
| Endogenous leukemia viruses, numerous strains | Mammals | — |
| Defective sarcoma/acute leukemia viruses | Rodents | — |
| Numerous strains including | | |
| Abelson murine leukemia virus | | |
| Murine sarcoma viruses (Harvey, Kirsten, Moloney, Rasheed) | | |
| Feline sarcoma viruses | Cats | — |
| (Snyder, Theilen, Gardner-Arnstein, McDonough, and other strains) | | |
| Simian sarcoma virus | Monkeys | — |
| Human T-cell leukemia/lymphoma virus | Humans | — |
| HTLV-I | | Isolated from patients with cutaneous T-cell lymphomas and adult T-cell leukemia |
| HTLV-II | | Isolated from a T-cell line established from a patient with a variant of hairy cell leukemia |
| Genus <i>Oncornavirus B</i> | | |
| Mouse mammary tumor virus | Mouse | — |
| (Bittner virus) (milk factor) | | |
| Viruses of guinea pigs, baboons, and other mammals | Mammals | — |
| Genus <i>Oncornavirus D</i> | | |
| Mason-Pfizer monkey virus (MPMV) | Rhesus monkey | — |
| Viruses from primates | Primates | ? |
| Guinea pig virus | Guinea pig | — |
| <i>Lentivirinae</i> | | |
| <i>Visna</i> | Sheep | — |
| <i>Maedi</i> | Sheep | — |
| Progressive pneumonia virus | Mice | — |
| Equine infectious anemia virus | Horse | — |
| Human immunodeficiency virus (HIV) | Humans | — |
| also known as human T-cell leukemia virus III (HTLV-III) or lymphadenopathy associated virus (LAV) | | Acquired immune deficiency syndrome (AIDS) |
| <i>Spumavirinae</i> | | |
| Human foamy virus | Human cells | — |
| Simian foamy viruses | Monkey kidney cells | — |
| 9 serotypes | | |
| Canine foamy virus | Dog kidney cells | — |
| Bovine syncytial virus | Bovine kidney cells | — |
| Feline syncytial virus | Feline cells | — |
| Hamster syncytial virus | Hamster cells | — |

(continued)